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Summaries of Economic Reports prepared for the Competition Bureau in its examination of cattle and beef industry pricing patterns before and since the onset of BSE

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BACKGROUND

In its examination of cattle and beef industry pricing patterns before and since the onset of BSE, the Competition Bureau retained two economic experts, Dr. Alan Love and Dr. David Bessler, professors at Texas A&M University's Department of Agricultural Economics, to obtain independent empirical analyses of industry conduct and pricing.

Dr. Love analysed industry data and employed a structural economic model to determine whether pricing patterns can be explained by the interruption of international trade flows due to BSE, or whether they reflect market power exertion.

Dr. Bessler studied price and quantity data to infer relationships between Canadian and US markets.

A summary of each economic report was prepared in consultation with the authors and is provided below. The complete reports are available in their original language by contacting the Competition Bureau's Information Centre.

SUMMARY OF
A TIME SERIES ANALYSIS OF CANADIAN CATTLE AND BEEF PRICES AND QUANTITIES PRIOR TO AND FOLLOWING THE MAY 2003 DISCOVERY OF BSE IN THE CANADIAN CATTLE HERD
BY DR. DAVID BESSLER

Dr. David Bessler studies price and quantity data measured monthly over the period January 1990 through May 2004 with modern time series econometric methods to infer relationships between and/or among seven Canadian cattle and beef related series and two US cattle series. Specifically, price indices on Canadian consumer-level and industrial-level (wholesale) beef prices, Canadian fed and feeder cattle prices, Canadian prices and quantities of export cattle, Canadian slaughter levels, original US cattle futures prices and US prices and quantities of export cattle are studied in a dynamic model (an Error Correction Model) fit through May 2003.

Dr. Bessler offers evidence on how cattle and beef related data series move together through time. The results can be described as follows. When the system of nine variables is out of long-run equilibrium, such equilibrium is restored by subsequent (next period) changes in five of the series: live cattle cash prices, futures prices of feeder cattle and fed cattle, the Consumer Price Index for beef and cattle slaughter. The other four series, industrial price index for beef, feeder cattle cash prices, live cattle export quantities and live cattle export prices do not respond to restore the system to equilibrium.

A major result from this model is that Canadian cattle and consumer beef prices are strongly influenced by price information first discovered in cattle futures contracts from the Chicago Mercantile Exchange.[1] Canadian prices before the May 2003 BSE event were discovered in the futures market. The Canadian industrial price index for beef was not influenced by cattle prices (both cash and futures) as strongly as its consumer price index comparison.

Dr. Bessler's analysis indicates that beef prices do not respond as drastically as do cattle prices to the border closing. This conclusion is not inconsistent with other findings in agricultural economics literature. As beef represents a processed good which includes inputs such as labour, transportation charges, interest charges and other manufacturing inputs in addition to cattle, a shock to price of one of its inputs will not manifest itself to the same degree in the price of the processed product.

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[1]Specifically, he finds that over 50% of the forecast uncertainty in Canadian fed (live) and feeder cattle prices, as well as consumer-level beef prices, are explained by information arising in the Chicago futures market for either feeder and/or fed cattle. Canadian Industrial (wholesale) prices do not exhibit such a strong influence from the Chicago markets.

SUMMARY OF
AN INVESTIGATION OF THE EFFECTS OF BSE
ON THE CANADIAN CATTLE AND BEEF MARKETS
BY DR. ALAN LOVE

Dr. Love uses a structural econometric model to examine how the closure of the Canadian beef and live cattle export markets may have affected observed market prices and quantities. Structural econometric analyses are conducted to assess the potential exertion of market power, the ability to profitably influence prices, by either beef retailers or packers in their input purchasing and output sales. Market conduct parameters are estimated using New Empirical Industrial Organization (NEIO) methods.[1] Using structurally derived marginal conditions for profit maximization, this approach estimates departures from competitive levels of market equilibrium quantity and price.[2]

To determine whether the exercise of market power shifted after May 2003, two sets of market power parameters are estimated: those before May 2003 and those for May 2003 and later. The model allows the effect of any demand shift due to the market closure or any potential change in market conduct that affected prices and quantities to be isolated. Hypothesis tests are conducted to determine whether there are statistically significant differences in market power exertion between the two time periods. If significant differences in market power exertion are detected, probable pricing patterns that would have been obtained as a result of international market closures alone can be determined through model simulations where post-event market power parameters are set to their pre-event levels.[3]

The empirical model is intrinsically nonlinear in both variables and parameters. Therefore, estimation of the unknown parameters must proceed by using a nonlinear simultaneous equations estimator. The estimation approach selected is iterated nonlinear three-stage least squares. The results are as follows:

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[1]Numerous recent studies have estimated market power exertion using NEIO techniques pioneered by Appelbaum (1979, 1982), Bresnahan (1982) and Lau. In his review of empirical studies of market power, Bresnahan (1989) cites numerous empirical studies utilizing NEIO models in various forms.

[2]It should be noted that Courts have criticized NEIO studies on the grounds that market power parameters may be mismeasured. In particular, Courts argue that estimated conduct parameters may understate the actual degree of market power if demand shocks are not permanent. However, Courts do not appear to take full advantage of parameter restrictions that would improve econometric identification and estimation of market power parameters. Recent studies have verified the usefulness of the NEIO method for determining market power exertion.

[3]The model specification extends methods developed in K. Raper, A. Love and R. Shumway (2000), "Determining Market Power Exertion Between Buyers and Sellers," *15 Journal of Applied Econometrics 225* as well as in J. Schroeter, A. Azzam and M. Zhang (2000), "Measuring Market Power in Bilateral Oligopoly," *66 Southern Economic Journal 526*. The model contains supply and demand relationships for three vertically related segments of the beef supply chain: retail, packer, and feeder/cull cattle production. These links are established within an overall framework supplemented by retail demand and fed cattle and cull cow/bull supply.

- Aggregate consumer demand for beef is inelastic (-0.566, p-value 0.038) with pork as a significant substitute.[4]
- Fed cattle supply is inelastic in both the short-run and long-run, with a short run elasticity of 0.440 (p-value of 0.000) and a long-run elasticity of 0.710 (p-value of 0.000).
- The export market provides an important substitution opportunity for fed cattle (cross-price elasticity of -0.361, p-value 0.000). This means that the export market closure for fed cattle resulted in a domestic supply shift to the right (expanded output), and thus the net effect of the border closure was a sizable shift of domestic cattle supply.

Based on the econometric supply and demand model, Dr. Love examines the observed degree of market power exertion. In this model, a coefficient estimate of zero is consistent with industry conduct that is observationally equivalent to perfect competition. At the other extreme, a coefficient estimate of one is consistent with industry conduct that is observationally equivalent to either monopoly or collusive oligopoly. The results are presented in Table 1.

Table 1: Market Power Exertion Estimates[5]

		Coefficient	t-statistic	p-value
Retailer/Wholesaler Monopoly	Pre-event	0.096	1.78	0.076
	Post-event	0.103	1.87	0.062
Packer Monopoly	Pre-event	0.054	1.51	0.131
	Post-event	0.122	2.1	0.036
Packer Monopsony (Fed Cattle)	Pre-event	-0.034	-2.39	0.017
	Post-event	-0.023	-0.98	0.329
Packer Monopsony (Cull Cattle)	Pre-event	0.198	2.89	0.004
	Post-event	0.585	2.84	0.005

Note: The negative packer monopsony (fed cattle) estimates may be the result of data inadequacies which are discussed in Dr. Love's report.

[4]Interestingly, the BSE event appears to have had no effect on domestic demand (the coefficient estimate on the relevant dummy variable is not statistically significant).

[5]This table reproduces Tables 6 and 7 of Dr. Love's report.

The conclusions from the analysis are as follows:

- While there is no appreciable monopsony market power exertion by beef packers in fed cattle markets, there is significant monopsony market power exertion in cull cattle markets.[6]
- All market power parameter estimates are well below levels that would be consistent with collusion.
- Most likely, the post-event observed price patterns are likely the result of both shifts in demand (i.e., absence of US demand for live cattle) and changes in market power exertion. Modest market power exertion at multiple stages in the supply chain likely resulted in double-marginalization which compounds the effect on price. These results are consistent with model simulations.

It is important to note that Dr. Love's analysis relied on publically available data and, as a result, there were several quite important data availability constraints. These data caveats are identified in section 8.2 of Dr. Love's report.

[6]Dr. Love notes that, while the observed decline in cull cattle prices may be due to packer exertion of market power, the decline may also be explained in part by packer disinclination to use older cattle found in the cull market after the BSE event.